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Linden et al.

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[54] INTRA-EXTRAVASCULAR DRUG DELIVERY  
CATHETER AND METHOD

5,236,424 8/1993 Imran.

## FOREIGN PATENT DOCUMENTS

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## [57] ABSTRACT

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## Related U.S. Application Data

[63] Continuation of Ser. No. 913,227, Jul. 14, 1992, abandoned.

[51] Int. Cl.<sup>6</sup> ..... A61M 31/00

[52] U.S. Cl. .... 604/53; 604/164; 604/264

[58] Field of Search ..... 604/22, 46, 53,  
604/96, 280, 164, 264, 272-274; 606/159,  
167, 171, 194

A drug delivery catheter is provided which includes a catheter comprised of an elongated tubular shaft with an inner lumen and a vessel puncturing element which is housed in the lumen. The puncturing element has a retracted position such that it will not be in contact with the vessel wall as the catheter is guided through the vasculature. The puncturing element also has a puncturing position where it protrudes radially outward of the catheter shaft and engages and punctures the vessel wall. The catheter is first inserted into the vessel to be treated and the puncturing element is positioned at the site in the vessel to be treated. The puncturing element is then moved to its puncturing position and the inner surface of the vessel wall is punctured. A drug is then delivered through the puncture. The drug may be delivered into either the vessel wall itself or to the outside of the vessel wall.

## [56] References Cited

## U.S. PATENT DOCUMENTS

4,578,061 3/1986 Lemelson.

56 Claims, 5 Drawing Sheets

